

Food Science

Cluster Big Idea:

- Sustaining life through innovations in food science.

Cluster Enduring Understandings:

- Food science is dynamical.
- Food science is a global economic system.
- Human preferences and needs affect the innovation of food.
- Food science serves a multifaceted role to sustain or improve the quality to life.

Cluster Essential Questions:

- What is food science?
- How is food science a global economic system?
- Why is food science considered a dynamic process?
- How is the development of life skills supported by food sciences?
- In what ways does food science affect the quality of life?

Standard Statement: Students will study food science and its relationship to human health by way of industry and technology.

Food Science

Performance Element FS.01: Explain and describe the functions of nutrients and the physiology of digestion.		
Performance Indicator FS.01.01: Identify essential nutrients for healthy living.		
Basic	Proficient	Advanced
<p>Define nutrition, nutrients, and calories.</p> <p>List and describe the functions of the six essential nutrients.</p> <p>Identify the compartments of the food pyramid.</p> <p>Define probiotics and prebiotics.</p> <p>Describe the historical uses of probiotics in different cultures.</p>	<p>Design an educational display based on the components of a healthy diet.</p> <p>Describe the health benefits of probiotics, prebiotics, and phytochemical compounds.</p> <p>Describe the historical evolution of food and nutritional needs.</p>	<p>Conduct a nutritional experiment related to the role of the essential nutrients.</p> <p>Discuss the influence of phytochemical compounds (i.e., antioxidants) on human metabolism and gene expression.</p> <p>Compare and contrast the dietary needs of an astronaut with the dietary needs of a person living on Earth.</p>
Performance Indicator FS.01.02: Identify the process of healthy digestion.		
Basic	Proficient	Advanced
<p>Describe the structure and function of the digestive system.</p> <p>Identify and define the digestive process.</p>	<p>Describe the function of digestive enzymes.</p> <p>Define variables that affect nutrient needs.</p>	<p>Analyze digestive enzymes and their functions in the digestive process.</p> <p>Create a healthy diet based on digestive needs.</p>

Food Science

Performance Element FS.02: Identify, explain, and demonstrate safe practices and procedures in food science.		
Performance Indicator FS.02.01: Demonstrate and analyze food handling safety and food-borne disease.		
Basic	Proficient	Advanced
<p>List and describe food safety hazards.</p> <p>Define food-borne outbreak and disease.</p> <p>Identify sources of food-borne hazards.</p> <p>Identify basic practices for handling food safely.</p> <p>Examine food handling guidelines during various food processes.</p> <p>Analyze food handling safety and food-borne disease.</p>	<p>Identify the intrinsic and extrinsic parameters of food that affect microbial growth (e.g., food composition and storage conditions).</p> <p>Define potentially hazardous food.</p> <p>Differentiate between pathogens and spoilage microorganisms.</p> <p>Outline laboratory techniques to detect food hazards.</p> <p>Describe basic practices for handling hazardous food safely.</p>	<p>Define and list the United States Department of Agriculture (USDA) recall classifications.</p> <p>Prepare food according to food handling guidelines.</p> <p>Practice prevention methods for food-borne disease.</p> <p>Evaluate food samples to identify food-borne disease.</p>
Performance Indicator FS.02.02: Demonstrate food preservation techniques and procedures.		
Basic	Proficient	Advanced
<p>Understand the historical methods of food preservation.</p> <p>Perform food preservation using historical methodology.</p>	<p>Describe the modern methods of food preservation.</p> <p>Explain the biological processes that occur during food preservation.</p>	<p>Investigate the most common preservation methodologies in the food industry.</p> <p>Describe the importance of modern technology to food safety (e.g., high pressure processing, irradiation, and pulse electric field).</p> <p>Perform food preservation techniques.</p> <p>Debate the pros and cons of food preservation.</p> <p>Discuss preservation techniques and procedures (e.g., visit a local or regional food industry).</p>

Food Science

Performance Indicator FS.02.03: Explain federal guidelines for food safety.		
Basic	Proficient	Advanced
List basic guidelines for food safety.	<p>Identify pertinent food regulations from the Food and Drug Administration (FDA), the United States Department of Agriculture (USDA), and others.</p> <p>Describe food safety programs, such as good agricultural practices (GAPs), good manufacturing practices (GMPs), and the Codex Alimentarius general principles of food hygiene.</p> <p>Explain the importance of food safety regulations.</p>	<p>Describe principles of quality-assurance systems, such as standard operating procedures (SOPs) and Hazard Analysis and Critical Control Point (HACCP).</p> <p>Debate the impact of food safety programs on the food industry.</p>

Performance Element FS.03: Identify the characteristics of safe, quality food products.		
Performance Indicator FS.03.01: Identify industry standards and grades.		
Basic	Proficient	Advanced
List and define the United States Department of Agriculture (USDA) grades.	<p>Differentiate between inspection and grading.</p> <p>Evaluate foods based on the United States Department of Agriculture (USDA) grades.</p> <p>Observe and discuss consumer safety regulations (e.g., visit the Animal and Plant Health Inspection Service office of the USDA).</p>	<p>Debate the future needs of industry standards and grades.</p> <p>Judge foods based on industry standards and grades.</p> <p>Debate the impact of new food composition on health and food safety.</p>

Food Science

Performance Indicator FS.03.02: Analyze food labels, additives, and enhancers.		
Basic	Proficient	Advanced
<p>Define and describe different food ingredients.</p> <p>Compare and contrast food additives with nutrients.</p> <p>Define generally regarded as safe (GRAS) ingredients.</p> <p>Identify the mandatory components of food labels.</p>	<p>Compare and contrast processed food products with natural and organic food products.</p> <p>Define probiotics and functional food ingredients.</p> <p>Debate adverse reactions produced by certain ingredients.</p> <p>Analyze food nutritional facts, health claims, and the different components of food labels.</p>	<p>Debate health claims in regard to probiotics and functional food ingredients.</p> <p>Debate the use of additives and enhancers in food products.</p> <p>Analyze food based on label information.</p> <p>Debate the impact of biotechnology on the production of food additives.</p> <p>Design a food label.</p> <p>Examine current research in flavor-and-taste technology (e.g., bitter suppressors and sweeteners).</p>

Performance Element FS.04: Understand food processing technology.		
Performance Indicator FS.04.01: Identify and explain food processing techniques and procedures.		
Basic	Proficient	Advanced
<p>Describe methods of food processing.</p> <p>Chart a food process and identify possible sources of contamination.</p> <p>Define the shelf life of food.</p> <p>Interpret expiration codes and the shelf life of stored foods.</p> <p>List the recommended shelf life of various food products.</p>	<p>Define and describe novel foods.</p> <p>Discuss food processing procedures (e.g., visit a food processing plant).</p> <p>Examine global and ethnic customs as they pertain to food processing.</p> <p>Demonstrate the effect of food processing on food preservation and food safety.</p> <p>Discuss and describe the impact of the development of space technology on food processing technology.</p>	<p>Describe modern technology in food processing.</p> <p>Demonstrate food processing techniques and procedures.</p> <p>Debate the effects of food processing methods on the functional properties of food.</p> <p>Develop a new product and demonstrate food processing procedures (e.g., participate in science fairs).</p> <p>Investigate how food processing technology can reduce food waste.</p> <p>Propose a model of future food processing on another planet.</p>

Food Science

Performance Indicator FS.04.02: Understanding packaging and portioning.		
Basic	Proficient	Advanced
<p>Identify various packaging materials.</p> <p>Identify recommended portion sizes.</p> <p>Compare and contrast new sealing technology with old sealing technology.</p> <p>Debate the environmental impact of food packaging materials.</p>	<p>Define intelligent indicators of food packaging.</p> <p>Describe the attributes of a good packaging design.</p> <p>Research various packaging methods.</p> <p>Design packaging for delicate foods (e.g., eggs and produce).</p> <p>Debate the challenges of portioning and food waste.</p>	<p>Evaluate different portion sizes based on food regulation standards.</p> <p>Explain the physical science behind a package.</p> <p>Compare the shelf life of food in different packages.</p> <p>Design a package for a new product.</p>
Performance Indicator FS.04.03: Understand the use of biotechnology in food processing.		
Basic	Proficient	Advanced
<p>Define biotechnology.</p> <p>Investigate the evolution of food biotechnology.</p> <p>List products of food biotechnology.</p>	<p>Investigate the use of biotechnology-based enzymes in the food industry.</p> <p>Describe the impact of food biotechnology along the food chain.</p> <p>Debate the economic benefits of food biotechnology for developing countries.</p>	<p>Research modern biotechnology methods used in food science.</p> <p>Debate the pros and cons of biotechnology use for food quality and processing.</p> <p>Describe the health and nutritional benefits of food products produced by biotechnology.</p> <p>Investigate bioprocesses (e.g., protein separation technology and fermentation) used in the development of innovative food products and ingredients.</p>

Performance Element FS.05: Understand the basic economics of food science technology.		
Performance Indicator FS.05.01: Identify the global implications of food science technology.		
Basic	Proficient	Advanced
<p>List the main imported and exported agricultural products in the United States.</p> <p>Chart or graph the global supply and distribution of food.</p> <p>Debate the impact of food-borne hazards on the food market (e.g., the 2006 <i>E. coli</i> outbreak in spinach).</p>	<p>Define and list the major agricultural commodities.</p> <p>Debate the effects of modern food science technology on the food market.</p> <p>Debate the impacts of food science technology on the global supply and distribution of food.</p>	<p>Analyze the effects of culture on the food industry.</p> <p>Debate the global economic implications of food science technology.</p> <p>Analyze the impacts of food safety regulations and programs on the global food market.</p>

Food Science

Performance Indicator FS.05.02: Recognize value-added products and consumerism.		
Basic	Proficient	Advanced
<p>Identify changes in consumer demand.</p> <p>Define value-added products and consumerism.</p>	<p>Determine factors that affect consumer trends.</p> <p>Design a value-added product or packaging.</p> <p>Analyze consumer concerns related to a specific food (e.g., raw meat or vegetables).</p> <p>Analyze the relation between consumer attitude and food waste.</p>	<p>Survey consumer attitude regarding specific food issues (e.g., pesticides, genetic modification, and irradiation).</p> <p>Debate the pros and cons of value-added products.</p> <p>Evaluate the economic implications for producers, companies, and consumers regarding specific food issues (i.e., food recalls, genetic modification, and irradiation).</p> <p>Identify factors that affect consumer perception of food safety (e.g., genetic modification and irradiation).</p>
Performance Indicator FS.05.03: Examine and analyze the marketing and advertising of agricultural products.		
Basic	Proficient	Advanced
<p>List marketing tools and procedures.</p> <p>Define advertising.</p> <p>Define marketing.</p>	<p>Describe the impact of labeling on the advertising of agricultural products.</p> <p>Design a marketing strategy.</p> <p>Develop a marketing plan.</p> <p>Develop an advertising plan.</p> <p>Analyze the impact of value-added food on the food market.</p> <p>Define global fair trade.</p>	<p>Debate the impact of technology on marketing.</p> <p>Develop an overall business plan.</p> <p>Construct a sales presentation.</p> <p>Discuss the impact of global fair trade policy on the food industry.</p>